

CLAIMS

1. A method of processing a signal, comprising:

applying an algorithm to:

selectively negate a plurality of samples of the signal to provide

5 negated and non-negated samples of the signal; and

use the negated and non-negated samples as in-phase (I) and/or

quadrature (Q) components of a plurality of complex samples;

the algorithm being such that the plurality of complex samples are

equivalent to the result that would be obtained by applying an effective sampling

10 function to the signal; and

selecting a beat frequency of the effective sampling function by adjusting

the algorithm.

2. A method of processing a signal as recited in Claim 1, further comprising
sampling the signal to obtain the plurality of samples of the signal.

- 15 3. A method of processing a signal as recited in Claim 1, further comprising
undersampling the signal to obtain the plurality of samples of the signal.

4. A method of processing a signal as recited in Claim 1, wherein the effective
sampling function is a complex sampling function.

5. A method of processing a signal as recited in Claim 1, wherein selecting a beat
20 frequency of the effective sampling function comprises adjusting the selection of the
plurality of samples of the signal that are negated.

6. A method of processing a signal as recited in Claim 1, wherein selecting a beat frequency of the effective sampling function comprises adjusting which ones of the negated and non-negated samples are used as in-phase components.
7. A method of processing a signal as recited in Claim 1, wherein selecting a beat
5 frequency of the effective sampling function comprises adjusting which ones of the negated and non-negated samples are used as quadrature components.
8. A method of processing a signal as recited in Claim 1, wherein the plurality of samples comprises a plurality of digital samples at a non-zero carrier frequency.
9. A method of processing a signal as recited in Claim 1, wherein the plurality of
10 complex samples comprises a plurality of complex samples of the signal at baseband.
10. A method of processing a signal as recited in Claim 1, wherein the signal is a modulated signal.
11. A method of processing a signal as recited in Claim 1, wherein the signal is a modulated signal and the plurality of complex samples comprise a directly
15 downconverted complex image of the modulated signal.
12. A method of processing a signal as recited in Claim 1, wherein applying the algorithm comprises negating the selected samples according to a negation sequence.
13. A method of processing a signal as recited in Claim 1, wherein applying the algorithm comprises negating the selected samples according to a negation sequence and
20 selecting a beat frequency of the effective sampling function by adjusting the algorithm comprises changing the negation sequence.

14. A method of processing a signal as recited in Claim 1, wherein applying the algorithm comprises sorting the negated and non-negated samples samples into in-phase and quadrature components according to a sorting sequence.
15. A method of processing a signal as recited in Claim 1, wherein applying the
5 algorithm comprises sorting the negated and non-negated samples samples into in-phase and quadrature components according to a sorting sequence, and selecting a beat frequency of the effective sampling function by adjusting the algorithm comprises changing the sorting sequence.
16. A method of processing a signal as recited in Claim 1, wherein each of the
10 plurality of samples results in either an I component of one of the plurality of complex samples or a Q component of one of the plurality of complex samples.
17. A method of processing a signal as recited in Claim 1, wherein each of the plurality of samples results in both an I component of one of the plurality of complex samples and a Q component of one of the plurality of complex samples.
- 15 18. A method of processing a signal as recited in Claim 1, wherein applying the algorithm comprises sorting each of the plurality of samples to determine whether the sample will result in an in-phase (I) component or a quadrature (Q) component and selecting the beat frequency of the effective sampling function comprises reversing the order of sorting to select a positive image or a negative image.
- 20 19. A method of processing a signal as recited in Claim 1, wherein adjusting the algorithm comprises modifying a beat coefficient.
20. A method of processing a signal as recited in Claim 1, wherein adjusting the algorithm comprises modifying a beat coefficient “n” comprising an integer by which the

rate of complex sampling events “T” is multiplied to yield the period of the beat frequency of the effective sampling function.

21. A method of processing a signal as recited in Claim 1, wherein the plurality of complex samples includes a baseband signal having a bandwidth, and the effective
5 sampling function includes a beat frequency greater than one half of the bandwidth.

22. A complex sample generation module configured to:

apply an algorithm to:

selectively negate a plurality of samples of a signal to provide
negated and non-negated samples of the signal; and

10 use the negated and non-negated samples as in-phase (I) and/or
quadrature (Q) components of a plurality of complex samples;

the algorithm being such that the plurality of complex samples are
equivalent to the result that would be obtained by applying an effective sampling
function to the signal;

15 and select a beat frequency of the effective sampling function by adjusting
the algorithm.

23. A complex sample generation module as recited in Claim 22, wherein the
complex sample generation module comprises a negation module configured to
selectively negate selected samples and a sorting module configured to sort the negated
20 and non-negated samples as I and Q components.

24. A complex sample generation module as recited in Claim 22, further comprising
an input connection configured to receive the plurality of samples and provide the
plurality of samples to the complex sample generation module.

25. A complex sample generation module as recited in Claim 22, further comprising an analog to digital converter configured to generate the plurality of samples of the signal.

26. A complex sample generation module as recited in Claim 22, wherein the
5 complex sample generation module comprises a field programmable gate array (FPGA).

27. A complex sample generation module as recited in Claim 22, wherein the complex sample generation module comprises an integrated circuit.

28. A complex sample generation module as recited in Claim 22, wherein the complex sample generation module comprises a processor configured to negate the
10 selected samples, sort the plurality of samples, and generate the plurality of complex samples.

29. A computer program product for processing a signal, the computer program product being embodied in a computer readable medium and comprising computer instructions for:

15 applying an algorithm to:

selectively negate a plurality of samples of the signal to provide negated and non-negated samples of the signal; and

use the negated and non-negated samples as in-phase (I) and/or quadrature (Q) components of a plurality of complex samples;

20 the algorithm being such that the plurality of complex samples are equivalent to the result that would be obtained by applying an effective sampling function to the signal; and

selecting a beat frequency of the effective sampling function by adjusting the algorithm.